

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
12 May 2005 (12.05.2005)

PCT

(10) International Publication Number
WO 2005/043545 A1

(51) International Patent Classification⁷: **G11C 11/15**

(74) Agent: **VIERING, JENTSCHURA & PARTNER**; P.O.
Box 1088, Rochor Post Office, Rochor Road, Singapore
911833 (SG).

(21) International Application Number:
PCT/SG2004/000356

(22) International Filing Date: 26 October 2004 (26.10.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/515,994 31 October 2003 (31.10.2003) US

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(71) Applicant (for all designated States except US): **AGENCY
FOR SCIENCE, TECHNOLOGY AND RESEARCH**
[SG/SG]; 20 Biopolis Way, #07-01 Centros, Singapore
138668 (SG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ZHENG, Yuankai**
[CN/SG]; Apt Blk 24 Teban Gardens Road, #09-168, Sin-
gapore 600024 (SG). **WU, Yihong** [SG/SG]; Blk 10 Dover
Rise, #17-09, Singapore 138680 (SG).

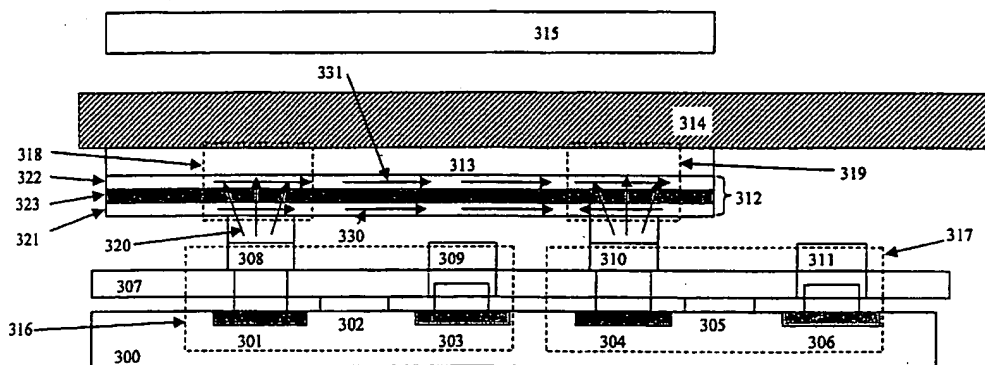
(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

[Continued on next page]

(54) Title: **NANO-CONTACTED MAGNETIC MEMORY DEVICE**



(57) Abstract: A magnetic memory device includes a plurality of transistors (316, 317) formed on a substrate and a common magnetic memory block (312) including multiple effective magnetoresistive elements (318, 319), a ferromagnetic recording (321), a non-magnetic space (323), and a free magnetic reading (322) layer formed above the transistors (316, 317). An extended common digital line (315) is located above the common magnetic memory block (312). The common magnetic memory block (312) is electrically connected with a respective source/drain electrode of the transistors (316, 317) through each a contact at a respective active area. The specific magnetization state of the ferromagnetic recording layer at the active areas can be changed by a heating process and applying an external field induced from the common digital line (315) and the bit (309, 311) or word (307) or word (307) lines. The change in resistance of the effective magnetoresistive element (318, 319) can be detected by means of changing the magnetization state of the free magnetic reacting layer during reading, thus a smaller switching field is required.

BEST AVAILABLE COPY



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.